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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

MAIL SORTER (gov. ser.) 1-27.10

B-427 or S-162

TM 001 594

U. S. Employment Service in
Cooperation with
Ohio State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
September 1959

GATB #2252
October 1958

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR MAIL SORTER 1-27.10

B-427 or S-162

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 80 applicants (12 men and 68 women) referred to the U. S. Post Office, Dayton, Ohio, as Mail Sorter 1-27.10 for Christmas season employment. The criterion consisted of scores made on the Post Office's Scheme Test. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, Q-Clerical Perception, and K-Motor Coordination were selected for inclusion in the test norms.

GATB Norms for Mail Sorter 1-27.10 - B-427 or S-162

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Mail Sorter 1-27.10.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-427 or S-162

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	95	G	Part 3 Part 4 Part 6	90
Q	CB-1-B	85	Q	Part 1	85
T	CB-1-G CB-1-K	80	K	Part 8	85

Effectiveness of Norms

The data in Table IV indicate that 18 of the 25 poor workers, or 72 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 72 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 42 of the 49 workers who made qualifying test scores, or 86 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Mail Sorter 1-27.10.

II. Sample

The GATB, B-1002A, was administered in October, 1958 to a sample of 107 applicants referred to the U. S. Post Office, Dayton, Ohio, for temporary jobs as Mail Sorter 1-27.10. Of the 107 tested applicants, 27 were eliminated from the sample; 14 because they had had experience as Mail Sorter during previous Christmas seasons and 13 were assigned jobs other than Mail Sorter. Therefore, the final sample consisted of 80 applicants (12 men and 68 women).

There are no experience requirements and no formal training period for Mail Sorters hired for the Christmas season. High school graduates are preferred but applicants with one year of high school are accepted. There is no upper age limit but applicants must be at least 18 years of age.

Although applicants are given the Post Office test for Mail Sorter, no tests were used in selection of these workers.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_c r$) for Age, Education, and Experience

Mail Sorter 1-27.10
N = 80

	M	σ	Range	$_c r$
Age (years)	33.1	9.4	18-53	.159
Education (years)	12.7	1.7	9-16	.129

There are no significant correlations with the criterion for age or education. There are no experience data because the sample consisted of applicants who were tested before they were on the job. The data in Table II indicate that this sample is suitable for test development purposes with respect to age and education.

III. Job Description

Job Title: Mail Sorter 1-27.10

Job Summary: Distributes letter mail in racks segregated according to zone number, station, carrier number, or company name in primary or secondary mail distribution area.

Work Performed: Picks up faced mail from ledge in left hand. Grasps single letter in right hand, notes address and places in proper slot in rack. (In secondary distribution, slots are designated by carrier number, company name or box number). Repeats until batch is sorted.

Replenishes mail on ledge by turning and grasping another batch of mail pieces from truck immediately behind work area and placing on ledge.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of scores made on a Scheme Test. Applicants were assigned a scheme and a case diagram for the scheme. They were allowed two weeks to learn the scheme at home, after which they reported to the Post Office for a Scheme Test. The Scheme Test consisted of a distribution of 100 cards from the assigned scheme. Scores were in terms of the number of cards correctly thrown per minute.

Of the 80 applicants, 55 passed the Scheme Test and 25 failed. Criterion scores were available for the 55 who passed the test but no record was made of the criterion scores for the 25 who failed. Therefore, the sample group was divided into three broad categories: the 25 who failed the test were placed in the poor group, the 25 with the highest scores in the good group, and the remaining 30 in the average group. For computational purposes, the three broad categories of good, average, and poor were converted to quantitative values of 61, 50, and 39, respectively.

VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations (corrected for broad categories) with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_c r$) for the Aptitudes of the GATB

Mail Sorter 1-27.10
N = 80

Aptitudes	M	σ	$_c r$
G-Intelligence	97.2	14.7	.372**
V-Verbal Aptitude	100.1	15.1	.478**
N-Numerical Aptitude	98.8	15.7	.352**
S-Spatial Aptitude	92.4	17.4	.101
P-Form Perception	102.2	16.6	.342**
Q-Clerical Perception	105.9#	14.9	.319**
K-Motor Coordination	107.0#	16.0	.361**
F-Finger Dexterity	99.8	17.7	.207
M-Manual Dexterity	107.8#	19.0	.116

** Significant at the .01 level
# Relatively high mean

The highest mean scores in descending order of magnitude were obtained for Aptitudes M, K, and Q, respectively. All the aptitudes have standard deviations of less than 20. Aptitude G has the lowest standard deviation.

For a sample of 80 cases, correlations of .287 and .220 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes G, V, N, P, Q, and K correlate significantly with the criterion at the .01 level.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Intelligence (G) - required to learn a scheme and its case diagram.

Clerical Perception (Q) - required for rapid and accurate perception of addresses on envelopes and to know proper slot for letter.

Finger Dexterity (F) and Manual Dexterity (M) - required to sort mail rapidly and to rapidly place it in proper slot in rack.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes G, P, Q, K, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

Aptitude	Relatively High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
G		X	X
P		X	
Q	X	X	X
K	X	X	
M	X		X

Aptitude P was given further consideration for inclusion in the norms because it had a significant correlation with the criterion at the .01 level and was not considered irrelevant on the basis of the qualitative analysis. Although Aptitudes V and N had significant correlations with the criterion at the .01 level, they were excluded from further consideration on the basis of the qualitative analysis. Aptitude F appeared to be important on the basis of the job analysis data, but was not given further consideration because there was no quantitative evidence of significance.

Various combinations of Aptitudes G, P, Q, K, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in section VII) was determined.

A comparison of the results showed that B-1002 norms consisting of G-90, Q-85, and K-85 had the best selective efficiency, a tetrachoric correlation coefficient of .69 with a standard error of .19. Although norms consisting of G-90, Q-85, and K-90 did yield a tetrachoric correlation coefficient of .69 with a standard error of .18, these norms screened out 34 of the 80 workers, or 43 percent of the sample, which is too high a proportion of the experimental sample in comparison to the proportion in the low criterion group.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 8 points of one standard deviation below the aptitude mean of the sample.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with those workers rated as Good and Average placed in the high criterion group, and with those rated as Poor placed in the low criterion group. This resulted in 25 of the 80 workers, or 31 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes G, Q, and K with critical scores of 90, 85, and 85, respectively, and the dichotomized criterion for Mail Sorter 1-27.10. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes G, Q, and K with Critical Scores of 90, 85, and 85, Respectively, and the Criterion for Mail Sorter 1-27.10

N = 80

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	13	42	55
Poor Workers	18	7	25
Total	31	49	80

$r_{tet} = .69$ $\quad X^2 = 14.962$

$\sigma_{r_{tet}} = .19$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G, Q, and K with minimum scores of 90, 85, and 85, respectively, are recommended as B-1002 norms for the occupation of Mail Sorter 1-27.10. The equivalent B-1001 norms consist of G-95, Q-85, and K-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. Since none of the existing 23 occupational aptitude patterns includes Aptitudes G, Q, and K, the selective efficiency of any existing occupational aptitude was not determined for this sample. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.